Waters Spatial Services

Description

Provides spatial services for the WATERS Reach Address Database (RAD). The RAD currently contains the results of spatial indexing of Office of Water entities (discharge facilities, impaired waters, assessed waters, etc.) against the National Hydrography Dataset (NHD). NHD, which is jointly maintained by EPA and USGS, is a digital (computerized) collection of points, lines and polygons that represent surface water features, such as streams, lakes and swamps. Simply put, the NHD can be thought of as 'the blue lines on a map'. In fact, the NHD includes more than 50 types of surface water features found on U.S. Geological Survey topographic maps. The surface water features within the NHD are further described by associated attributes, including geographic location, type and name (when one exists).

WATERS uses the NHD addressing system to link EPA *Water Program features*, such as water monitoring sites, to the underlying *surface water features* (streams, lakes, swamps, etc). This linkage enables geographic integration, analysis and display of data stored in different EPA Water Program databases using computer-based tools, such as a Geographic Information Systems (GIS). The NHD addressing system employs a unique, standard identifier, known as the reach code, for each segment of water across the country. Reach codes provide the foundation or common 'language' supporting integrated surface water analysis between EPA Water Programs, states, tribes and other users.

Endpoint

http://iaspub.epa.gov/WATERSWebServices/SpatialServices

WSDL

http://www.epa.gov/waters/wsdls/SpatialServices.wsdl

Operations

- validateLatLong
- convertLatLong

- getEntitiesByLatLong
- getProgramWaterEntities

validateLatLong

Description

Utility function for validating a point geographic location's latitude and longitude measure given in decimal degrees for use against the Reach Address Database (RAD). The default horizontal datum for RAD use is NAD83. If a horizontal datum of NAD27 or WGS84 is provided, the service will convert the given latitude and longitude to NAD83 and return these converted values.

Input

Parameter	Datatype	Description
latitude	number	Decimal degree value
Longitude	number	Decimal degree value
horizontal_datum	string	Name of the datum used (NAD27, NAD83, WSG84)

Output

Parameter	Datatype	Description
valid_lat_long	VALID_LAT_LONG	Object containing latitude, longitude, and conversion message

convertLatLong

Description

Utility function for converting a point geographic location latitude and longitude in degrees, minutes, and seconds to decimal degrees. If a horizontal datum other than NAD83 is input, then the returned latitude and longitude will be converted to NAD83.

Input

Parameter	Datatype	Description
latitude_degrees	number	Integer value
latitude_minutes	number	Integer value
latitude_seconds	number	Integer value
longitude_degrees	number	Integer value
longitude_minutes	number	Integer value
longitude_seconds	number	Integer value
horizontal_datum	string	Name of the datum used (NAD27, NAD83, WSG84)

Output

Parameter	Datatype	Description
valid_lat_long	VALID_LAT_LONG	Object containing latitude, longitude, and conversion message

getEntitiesByLatLong

Description

Query for identifying details of all water entities within a given radius of a specified geographic location for specific WATERS programs.

Input

Parameter	Datatype	Description
latitude	number	Decimal degrees value
longitude	number	Decimal degrees value
search_radius_miles	number	Distance in miles from latitude/longitude location
programs_list	PRG_LIST	List of program name acronyms

Output

Parameter	Datatype	Description
water_data	WATER_DATA	Object containing program and entity data. Within program, entities are returned in order of distance from the input latitude and longitude.

getEntitiesMilesByLatLong

Description

Query for identifying details of all water entities within a given radius of a specified geographic location for specific WATERS programs.

Input

Parameter	Datatype	Description
latitude	number	Decimal degrees value
longitude	number	Decimal degrees value
search_radius_miles	number	Distance in miles from latitude/longitude location
programs_list	PRG_LIST	List of program name acronyms

Output

Parameter	Datatype	Description
Program_entity_distance_data	PROGRAM_ENTITY_DISTANCE_DATA	Object containing program and lists of associated entities with their distance in miles from the given latitude and longitude.

getProgramWaterEntities

Description

Query for identifying details of a given list of entities for specific WATERS programs.

Input

Parameter	Datatype	Description
program_entities_list	PROGRAM_ENTITIES_LIST	Object containing list of program name acronyms and list of entity IDs for each

Output

Parameter	Datatype	Description
water_data	WATER_DATA	Object containing program and entity data

Object Types used by queries in Spatial Services

PRG_LIST

Description

List of program acronyms. This list may contain the following programs:

Program Acronym	Program Name
303D	Total Maximum Daily Load (TMDL) / NTTS
305B	Water Quality Inventory / NAD / 305(b)
BEACH	BEACH program
CSO	Combined Sewer Overflows / CSO
CWNS	Clean Watersheds Needs Survey / CWNS 2000
FISH	Fish Consumption Advisories / NLFWA
GRTS	Nonpoint Source Pollution / GRTS
NDZ	Vessel Sewage Discharge / NDZ
NEP	National Estuary Program / NEP
PCS	NPDES Permits / PCS

Note: RED Colored programs are not currently implemented

Structure

PRG_LIST
list of: [varchar2(30)]

PROGRAM_ENTITIES_LIST

Description

List of programs and water entity IDs for each program. PROGRAM_NAME must match the acronyms identified above. ENTITY_ID must be a valid ID for an entity in the specified program.

Structure

PROGRAM_ENTITIES_LIST
list of: PROGRAM_ENTITIES
PROGRAM_NAME [varchar2(30)]

ENTITY_LIST
list of: [varchar2(100)]

VALID_LAT_LONG

Description

Latitude and Longitude, plus a message describing the conversion results.

Structure

VALID_LAT_LONG
LATITUDE [number]
LONGITUDE [number]
MESSAGE [varchar2(4000)]

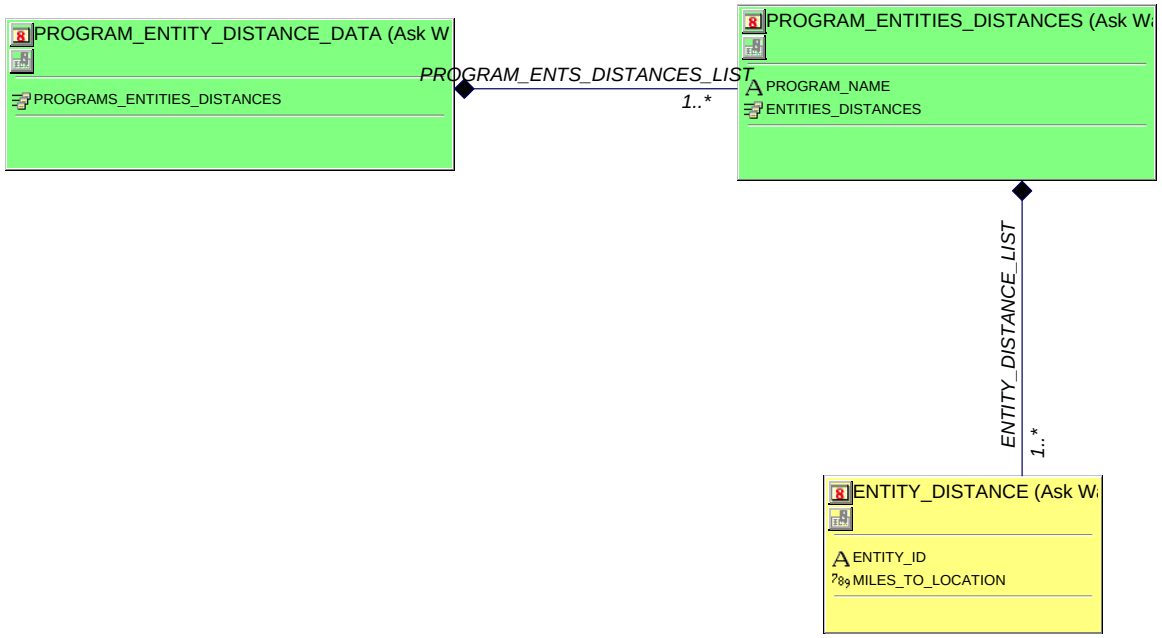
PROGRAM_ENTITY_DISTANCE_DATA

Description

Lists of programs and associated entities with their distance in miles from the given latitude and longitude.

Structure:

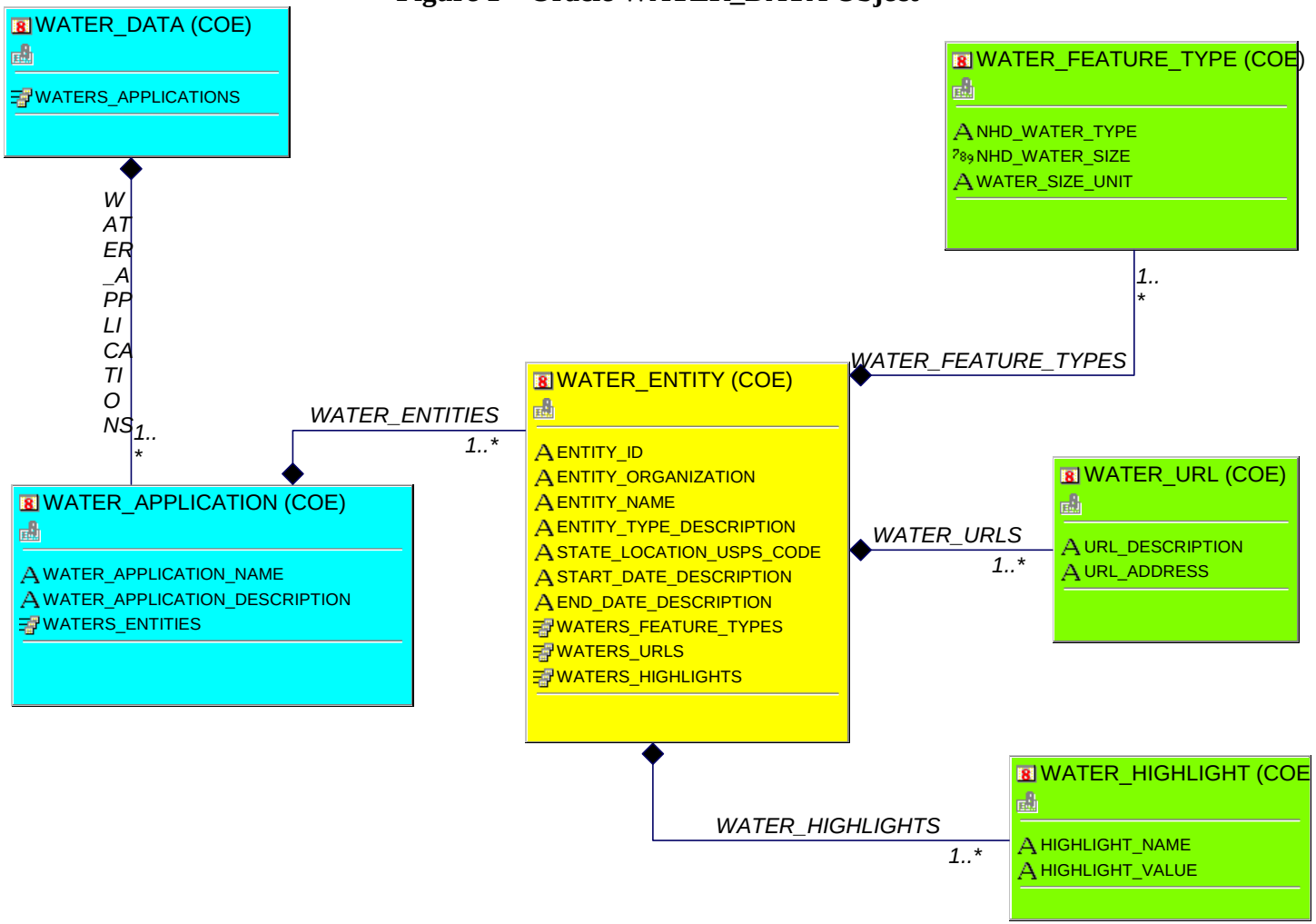
WATER_DATA



The purpose of the water data object is to provide a standard output to web services against the WATERS Reach Address Database. Whenever a spatially oriented service identifies a list of water entities from the RAD, this object is used to return information about those entities. The design goal of this object was to provide enough information about a water entity so that the information needs of the calling web service would be met 50% of the time. Instead of just returning an entity_id from the RAD tables, this object will return identifying information about the entity, links to existing web reports for the entity, information about the water that the entity is indexed to, and program specific data of interest for the entity. Figure 1 below identifies the individual objects and attributes that comprise the WATER_DATA object. A table follows the figure to provide a definition of each object and attribute.

From an architectural perspective, the WATERS team constructed a database procedure that builds a Water Data Object based on a list of water entities passed to it. Materialized views, containing entity level program attribute data, are used as a data source to efficiently populate the object. Based on differences between the various program applications that are contained within the RAD, not all objects and attributes will be populated for a given program application.

Figure 1 – Oracle WATER_DATA Object



ORACLE WATER_DATA OBJECT DEFINITIONS

Oracle Object Name	Object Type	Definition
WATER_DATA	Data object	Object container for all child WATERS data objects.
WATERS_APPLICATIONS	Collection (table)	Collection object for WATER_APPLICATION.
WATER_APPLICATION	Data object	Object container that describes an application database that is contained within WATERS
WATER_APPLICATION_NAME	Column Attribute, varchar2(100)	The common EPA name of the database application within WATERS.
WATER_APPLICATION_DESCRIPTION	Column attribute, varchar2(4000)	The application description of the database application within WATERS.
WATERS_ENTITIES	Collection (table)	Collection object for WATER_ENTITY
WATER_ENTITY	Data object	Object container that identifies the data of interest of each water entity in the RAD.
ENTITY_ID	Column attribute, varchar2(60)	The key identifier of the water entity. This value is used to relate the RAD information back to the program system.
ENTITY_NAME	Column attribute, varchar2(100)	The name of the program system entity. Examples would include water body name for 303(d) entities or facility name for PCS entities.
ENTITY_TYPE_DESCRIPTION	Column attribute, varchar2(250)	A description of the entity type. Examples; facility, impaired water, assessed water, …
STATE_LOCATION_USPS_CODE	Column attribute, varchar2(2)	The 2 character USPS code for the state or territory that the facility is located in.
START_DATE_DESCRIPTION	Column attribute, varchar2(250)	A description of the RAD start date or the actual start of the date range that this entity was of current interest to EPA.
END_DATE_DESCRIPTION	Column attribute, varchar2(250)	A description of the RAD end date or the actual end of the date range that this entity

Oracle Object Name	Object Type	Definition
		was of current interest to EPA.
WATERS_FEATURE_TYPES	Collection (table)	Collection object of WATER_FEATURE_TYPE.
WATERS_URLS	Collection (table)	Collection object of WATER_URL
WATERS_HIGHLIGHTS	Collection (table)	Collection object of WATER_HIGHLIGHT
WATER_FEATURE_TYPE	Data object	Object container that identifies the water feature types from the NHD for the indexed water entity
NHD_WATER_TYPE	Column attribute, varchar2(50)	The water type, e.g. (LAKE/POND, STREAM/RIVER, …) from the NHD for the water entity.
NHD_WATER_SIZE	Column attribute, number	The calculated size from the NHD indexing of the water entity for this feature type.
WATER_SIZE_UNIT	Column attribute, varchar2(50)	The unit of measure of the water size. Examples; miles, acres.
WATER_URL	Data object	Object container that identifies URL report links for the water entity.
URL_DESCRIPTION	Column attribute, varchar2(250)	A description of the URL. Example: ECHO PCS Facility Report.
URL_ADDRESS	Column attribute, varchar2(1000)	The hypertext link for the entity web report given in http format.
WATER_HIGHLIGHT	Data object	Object container that details a specific named value pairs of interest of the water entity for the water application.
HIGHLIGHT_NAME	Column attribute, varchar2(100)	The name of the specific water entity feature of interest (highlight). Examples; 305(b) Water Assessment Status, 303(d) Causes of Impairment, PCS Facility Type, etc.
HIGHLIGHT_VALUE	Column attribute, varchar2(1000)	The value of the water entity feature of interest.

CURRENT WATER_HIGHLIGHTS

A WATER_HIGHLIGHT, is a named-value pair of data that provides information of general interest about the returned water entity. The values for WATER_HIGHLIGHT are unique for each Water Application. A given Water Application may have more than one highlight. The following table lists the current WATER_HIGHLIGHT named-value pairs for each Water Application.

Water Application	Service Acronym	Highlight Name	Highlight Value
Water Quality Inventory / NAD / 305(b)	305B	Assessed Status	The overall attainment status of the assessed water based on assessments of the water's defined uses against the state's current Water Quality Standards. Values: **Good** – No uses are impaired **Impaired** – One or more uses have been assessed as not meeting existing standards. **Threatened** – Although no uses are currently impaired, the state has determined that one or more uses will be impaired in the next two years. **Not Assessed** – The water was not assessed.
Water Quality Inventory / NAD / 305(b)	305B	Integrated Reporting Category	A complete description of the different reporting categories can be found in this PDF: http://www.epa.gov/owow/tmdl/2006IRG/report/2006irg-sec5.pdf.

Water Application	Service Acronym	Highlight Name	Highlight Value
Total Maximum Daily Load (TMDL) / ATTAINS	303D	Current TMDL Id	Provides the latest approved or established TMDL Id recorded in EPA's ATTAINS system for the impaired (on the 303d list) water. Note: In addition to this value, the WATERS_URLS object will have an entry that provides a list of all TMDLs approved for the given listed water.
Total Maximum Daily Load (TMDL) / ATTAINS	303D	Water TMDL Status	**TMDL Needed** – one or more associated causes of impairment for the water needs a TMDL. **TMDLs Completed** – all associated causes of impairment have been addressed by a TMDL or de-listed by another means.
NPDES Permits / PCS	PCS	Major/Minor Indicator	Indicates whether the facility is a Major facility or a minor facility. The reporting requirements of the state to EPA are greater for major facilities.
NPDES Permits / PCS	PCS	Permit Issued Date	The last date that the permit was issued to the facility.
NPDES Permits / PCS	PCS	Permit Expired Date	The date that the current issued facility permit expires.
NPDES Permits / PCS	PCS	Permit Type	The type of permit; Standard Individual, Standard General, Pretreater, Wetlands, etc.
NPDES Permits / PCS	PCS	Permit Issue Type	The issuance type of the permit; POTWR, EPA, State, Citizen, etc.
NPDES Permits / PCS	PCS	SIC Code and Description	The Standard Industrial Classification Code and its textual description.
National Estuary Program / NEP	NEP	Year Designated	The year the estuary was designated into the national program.
Combined Sewer Overflows / CSO	CSO	Permittee Category	Indicates whether or not the facility is a Major or a Minor.

Water Application	Service Acronym	Highlight Name	Highlight Value
Combined Sewer Overflows / CSO	CSO	Last Updated	The date the data for the facility was last updated.
Vessel Sewage Discharge / NDZ	NDZ	No Discharge Zone Description	A textual description of the vessel no-discharge zone.
Clean Watersheds Needs Survey / CWNS 2000	CWNS	Review Status	The EPA needs review status for the facility.
Clean Watersheds Needs Survey / CWNS 2000	CWNS	Total Federal Needs	The total federal needs documented for the facility.
Clean Watersheds Needs Survey / CWNS 2000	CWNS	Total State Needs	The total state needs documented for the facility.

CURRENT ORACLE OBJECT NAMES TO XML TAGS MAPPING FOR WATER_DATA

The Oracle WATER_DATA object is created and populated by stored database procedures within the WATERS Oracle database. When these database procedures are exposed as web services by Oracle's Jdeveloper tool, the Oracle database object names are automatically converted to a name that can be used by a Java program. These Java-based names are then exposed through the web service as XML tags. The following table relates the Oracle object name to the XML tag name. When the data objects are being defined as a complex type, the complex type tag name is prefixed by an Oracle connection identifier and suffixed by the literal "User". This connection identifier equates to the "jdev:packageName" that is recorded in the service Web Services Description Language (WSDL) document. An example of this would be "waterData" becomes "waters9i_waters_WaterApplicationUser". When the data object is embedded within a complex type, then the element name for the data object is used.

Oracle WATER_DATA Object Name	XML Tag Name
WATER_DATA	waterData
WATERS_APPLICATIONS	watersApplications
WATER_APPLICATION	waterApplicationUser
WATER_APPLICATION_NAME	waterApplicationName
WATER_APPLICATION_DESCRIPTION	waterApplicationDescription
WATERS_ENTITIES	watersEntities
WATER_ENTITY	waterEntity
ENTITY_ID	entityId
ENTITY_NAME	entityName
ENTITY_TYPE_DESCRIPTION	entityTypeDescription
STATE_LOCATION_USPS_CODE	stateLocationUspsCode
START_DATE_DESCRIPTION	startDateDescription
END_DATE_DESCRIPTION	endDateDescription
WATERS_FEATURE_TYPES	watersFeatureTypes
WATERS_URLS	watersUrls
WATERS_HIGHLIGHTS	watersHighlights
WATER_FEATURE_TYPE	waterFeatureType
NHD_WATER_TYPE	nhdWaterType
NHD_WATER_SIZE	nhdWaterSize
WATER_SIZE_UNIT	waterSizeUnit

Oracle WATER_DATA Object Name	XML Tag Name
WATER_URL	waterUrl
URL_DESCRIPTION	urlDescription
URL_ADDRESS	urlAddress
WATER_HIGHLIGHT	waterHighlight
HIGHLIGHT_NAME	highlightName
HIGHLIGHT_VALUE	highlightValue